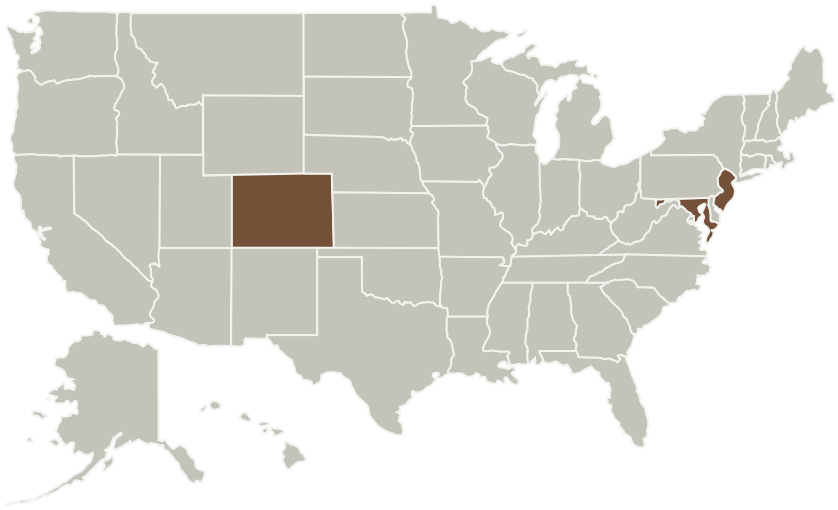
Large-scale Polarimeter Array with Integrated Tunnel Junction Cooling

Completed Technology Project (2017 - 2019)

Project Introduction

Normal-Insulator-Superconductor (NIS) tunnel junctions are solid-state devices capable of cooling thin film or bulk payloads at sub-Kelvin temperatures. The performance of NIS refrigerators has improved steadily in recent years and we will leverage this progress to build an array of microwave polarimeters with integrated NIS cooling. The use of NIS refrigerators will improve pixel sensitivity, size, and mechanical robustness. By design, the polarimeter array will be well matched to a future suborbital mission to study polarization in the cosmic microwave background. The array will also demonstrate the suitability of NIS refrigerators for a future NASA satellite mission.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
National Institute of Standards and Technology(NIST)	Supporting Organization	US Government	Boulder, Colorado

Primary U.S. Work Locations	
Colorado	Maryland

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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics Research and Analysis

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Primary U.S. Work Locations *(cont.)*

New Jersey

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

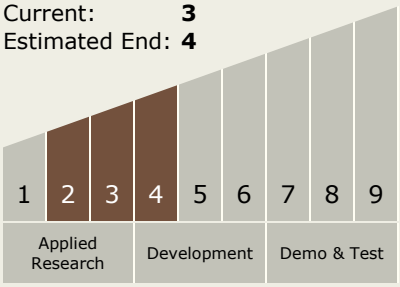
Joel Ullom

Co-Investigators:

William C Jones
Johannes Hubmayr
Shannon M Duff
Gene C Hilton
Xiaohang Zhang
Julie Weiblinger

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors

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Technology Areas *(cont.)*

- TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System